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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/775,911	02/10/2004	Dennis R. Morgan	Morgan 13	1216

46303 7590 01/05/2010
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EXAMINER	
CURS, NATHAN M	

ART UNIT	PAPER NUMBER
2613	

MAIL DATE	DELIVERY MODE
01/05/2010	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/775,911	MORGAN, DENNIS R.	
	Examiner	Art Unit	
	NATHAN M. CURS	2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 September 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-22* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-11 and 13-22* is/are rejected.

7)☒ Claim(s) *6, 12* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Objections

1. Claim 18 is objected to because of the following informalities:

Claim 18 in line 4, "adjusting step" should be "adjustment" for consistency.

Appropriate correction is required.

.*Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. **Claims 1-4 and 13-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Madsen et al.** ("Optical filter architecture for approximating any 2 x 2 unitary matrix," Optics Letters, vol. 28, no. 17, April 1, 2003, pages 534-536) in view of **MacFarlane et al.** (US 6,687,461 B1).

Regarding **claim 1**, Madsen et al. disclose a method for compensating for polarization mode dispersion in an optical fiber communication system (Figures 1-3), comprising the steps of:

reducing the polarization mode dispersion using a cascade of two-port all-pass filters (see Abstract and Figure 3); and

adjusting coefficients of the two-port all-pass filters (see page 535, left column, first complete paragraph), wherein said adjusting step is performed by a device (fig. 1 and page 534 col. 1 second paragraph).

Regarding **claim 13**, as similarly discussed above with regard to claim 1, Madsen et al. disclose a polarization mode dispersion compensator in an optical fiber communication system, comprising:

a cascade of two-port all-pass filters having coefficients that are adjusted (again, see Abstract, Figure 3, and page 535, left column, first complete paragraph) wherein said adjustment is performed by a device (fig. 1 and page 534 col. 1 second paragraph).

Regarding claims 1 and 13, Madsen et al. disclose a cascade of two-port all-pass filters insofar as they disclose all-pass filters having two ports which are cascaded together (Figure 3 of Madsen et al. shows a cascade of two-port all-pass filters similar to that shown Applicant's Figure 4). Further regarding claims 1 and 13, Madsen et al. disclose adjusting the coefficients using a least squares algorithm (see page 535, left column, first complete paragraph) but do not specifically disclose adjusting the coefficients using a least mean square algorithm.

However, various optimization algorithms are well known in the signal processing and communication arts, and MacFarlane et al. in particular teach a system that is related to the one described by Madsen et al. including optical filters for compensating polarization mode dispersion having adjusted coefficients (column 1, lines 28-53; column 2, lines 51-65; column 5, lines 23-42). MacFarlane et al. specifically teach that the apparatus compensates signal irregularities "including chirp, polarization, and

frequency dispersion" (column 1, lines 43-46). MacFarlane et al. further teach that the filter coefficients may be adjusted using a variety of minimization algorithms, including a least squares algorithm or a least mean square algorithm (column 19, lines 16-22).

Regarding claims 1 and 13, it would have been obvious to a person of ordinary skill in the art to specifically use a least mean square algorithm as taught by MacFarlane et al. in the system disclosed by Madsen et al. as an engineering design choice of another way to provide the minimization function already disclosed by Madsen et al. (Madsen et al., page 535, left column, first complete paragraph) and thereby effectively adjust the filter coefficients to quickly and accurately compensate dispersion. Both Madsen et al. and MacFarlane et al. teach various algorithms for performing a minimizing function, and it would have been obvious to a person of ordinary skill in the art to substitute one minimization algorithm for another to achieve a predictable result of optimizing the filter coefficient values. Furthermore, MacFarlane et al. particularly teach the substitution of least mean square algorithm for a least squares algorithm (column 19, lines 16-22).

Regarding **claims 2 and 14**, Madsen et al. disclose that the cascade of two-port all-pass filters comprises a two-channel structure consisting of multiple cascades of all-pass filters and directional couplers (Figure 3).

Regarding **claims 3 and 15**, Madsen et al. disclose that the coefficient values are adjusted to minimize a cost function (page 535, left column, first complete paragraph). Examiner notes that MacFarlane et al. also teach adjusting filter coefficients to minimize a cost function (column 19, lines 16-22).

Regarding **claims 4 and 16**, Madsen et al. disclose measuring the polarization mode dispersion in a received optical signal (using the “estimate channel” element shown in Figure 1; see also page 534, left column, second complete paragraph).

4. **Claims 5 and 17** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Madsen et al.** in view of **MacFarlane et al.** as applied to claims 4 and 16 respectively above, and further in view of **Applicant's Admitted Prior Art.**

Regarding **claims 5 and 17**, Madsen et al. in view of MacFarlane et al. describe a system and a method as discussed above with regard to claims 4 and 16 respectively, including a step of measuring the polarization mode dispersion in a received optical signal. They do not specifically suggest that the measuring step employs a tunable narrowband optical filter to render information from energy detector measurements.

However, Applicant's Admitted Prior Art (Applicant's Figures 1-3) suggests a system that is related to the one described by Madsen et al. in view of MacFarlane et al., including a polarization mode dispersion compensator 110 and a channel estimate element 300 for measuring polarization mode dispersion in a received optical signal (Applicant's specification, page 3, lines 3-25). Applicant's Admitted Prior Art further suggests that the measuring step employs a tunable narrowband optical filter 304 to render information from energy detector measurements (see Applicant's Figure 3 and specification, page 3, lines 26-32 and page 4, lines 1-4).

Regarding claims 5 and 17, it would have been obvious to a person of ordinary skill in the art to include a tunable narrowband optical filter as taught by Applicant's

Admitted Prior Art in the system described by Madsen et al. in view of MacFarlane et al. in order to effectively provide the polarization mode dispersion measurement already disclosed by Madsen et al. and thereby enable the filters to compensate for the dispersion accurately.

5. **Claims 7-10 and 18-21** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Madsen et al.** ("Optical filter architecture for approximating any 2 x 2 unitary matrix," Optics Letters, vol. 28, no. 17, April 1, 2003, pages 534-536) in view of **Eyal. et al.** ("Design of Broad-Band PMD Compensation Filters," IEEE Photonics Technology Letters, vol. 14, no. 8, August 2002, pages 1088-1090).

Regarding **claim 7**, Madsen et al. disclose a method for compensating for polarization mode dispersion in an optical fiber communication system (Figures 1-3), comprising the steps of:

reducing the polarization mode dispersion using a cascade of two-port all-pass filters (see Abstract and Figure 3); and

adjusting coefficients of the two-port all-pass filters (see page 535, left column, first complete paragraph), wherein said adjusting step is performed by a device (fig. 1 and page 534 col. 1 second paragraph).

Regarding **claim 18**, as similarly discussed above with regard to claim 7, Madsen et al. disclose a polarization mode dispersion compensator in an optical fiber communication system, comprising:

a cascade of two-port all-pass filters having coefficients that are adjusted (again, see Abstract, Figure 3, and page 535, left column, first complete paragraph), wherein said adjusting step is performed by a device (fig. 1 and page 534 col. 1 second paragraph).

Regarding claims 7 and 18, Madsen et al. disclose a cascade of two-port all-pass filters insofar as they disclose all-pass filters having two ports which are cascaded together (Figure 3 of Madsen et al. shows a cascade of two-port all-pass filters similar to that shown Applicant's Figure 4). Further regarding claims 7 and 18, Madsen et al. disclose adjusting the coefficients using a least squares algorithm (see page 535, left column, first complete paragraph) but do not specifically disclose adjusting the coefficients using a Newton algorithm.

However, various optimization algorithms are well known in the signal processing and communication arts, and Eyal. et al. in particular teach a system that is related to the one described by Madsen et al. including optical filters for compensating polarization mode dispersion having adjusted coefficients (page 1088). Eyal et al. further teach that the filter coefficients may be adjusted using a Newton algorithm (page 1089, see particularly the end of the first paragraph of the right column).

Regarding claims 7 and 18, it would have been obvious to a person of ordinary skill in the art to specifically use a Newton algorithm as taught by Eyal et al. in the system disclosed by Madsen et al. as an engineering design choice of another way to provide the minimization function already disclosed by Madsen et al. (Madsen et al., page 535, left column, first complete paragraph) and thereby effectively adjust the filter

coefficients to quickly and accurately compensate dispersion. Both Madsen et al. and Eyal et al. teach various algorithms for performing a minimizing function, and it would have been obvious to a person of ordinary skill in the art to substitute one minimization algorithm for another to achieve a predictable result of optimizing the filter coefficient values.

Regarding **claims 8 and 19**, Madsen et al. disclose that the cascade of two-port all-pass filters comprises a two-channel structure consisting of multiple cascades of all-pass filters and directional couplers (Figure 3).

Regarding **claims 9 and 20**, Madsen et al. disclose that the coefficient values are adjusted to minimize a cost function (page 535, left column, first complete paragraph). Examiner notes that Eyal et al. also teach adjusting filter coefficients to minimize a cost function (page 1089).

Regarding **claims 10 and 21**, Madsen et al. disclose measuring the polarization mode dispersion in a received optical signal (using the "estimate channel" element shown in Figure 1; see also page 534, left column, second complete paragraph).

6. **Claims 11 and 22** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Madsen et al.** in view of **Eyal et al.** as applied to claims 7 and 18 respectively above, and further in view of **Applicant's Admitted Prior Art.**

Regarding **claims 11 and 22**, Madsen et al. in view of Eyal et al. describe a system and a method as discussed above with regard to claims 7 and 18 respectively, including a step of measuring the polarization mode dispersion in a received optical

signal. They do not specifically suggest that the measuring step employs a tunable narrowband optical filter to render information from energy detector measurements.

However, Applicant's Admitted Prior Art (Applicant's Figures 1-3) suggests a system that is related to the one described by Madsen et al. in view of Eyal et al., including a polarization mode dispersion compensator 110 and a channel estimate element 300 for measuring polarization mode dispersion in a received optical signal (Applicant's specification, page 3, lines 3-25). Applicant's Admitted Prior Art further suggests that the measuring step employs a tunable narrowband optical filter 304 to render information from energy detector measurements (see Applicant's Figure 3 and specification, page 3, lines 26-32 and page 4, lines 1-4).

Regarding claims 11 and 22, it would have been obvious to a person of ordinary skill in the art to include a tunable narrowband optical filter as taught by Applicant's Admitted Prior Art in the system described by Madsen et al. in view of Eyal et al. in order to effectively provide the polarization mode dispersion measurement already disclosed by Madsen et al. and thereby enable the filters to compensate for the dispersion accurately.

Allowable Subject Matter

7. **Claims 6 and 12** are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Response to Arguments

8. Applicant's arguments filed 24 September 2009 have been fully considered but they are not persuasive.

In page 7 lines 14-25 and page 8 lines 1-3, page 10 lines 6-12 and page 11 lines 4-6 and lines 25-27, Applicant argues that it would not have been obvious to use the LMS algorithm of MacFarlane in place of the LS algorithm of Madsen for the reasons 1) that *it is not known* to do so, and 2) that the LMS algorithm *does not apply* to the adaptation of two-port all-pass filters and thus would not work. The first prong is not persuasive because it amounts to arguing that there has been a failure to anticipate the limitation in a single reference. However, anticipation is not required for a proper obviousness rejection under 35 USC § 103. The second prong is not persuasive because Applicant has merely made conclusory statements without providing any reasoning or evidence that the LMS algorithm cannot be applied as described in the rationale of the rejection.

In the Remarks page 7 line 26 to page 8 line 1, Applicant argues that a two-port all-pass filter is not advantageous and that an FIR filter is easier to implement, and that persons of ordinary skill in the art would not be motivated to substitute a two-port all-pass filter for a FIR filter "in the manner suggested by the Examiner". This argument is not persuasive because Madsen already expressly discloses a two-port all-pass filter. The obviousness rejections are built on the fact that two-port all-pass filters are expressly disclosed by Madsen, and thus do not involve substituting them in place of FIR filters, nor did the Examiner make such a suggestion.

In the Remarks page 8 lines 4-24 and page 9 lines 10-17, for claims 7 and 18, which call for the Newton algorithm instead of the LMS algorithm of claims 1 and 13, Applicant essentially repeats the above arguments for the Newton case. Thus, these arguments are not persuasive for the above reasons.

In the Remarks page 8 lines 25-31 and page 9 lines 18-23, Applicant argues that MacFarlane does not disclose or suggest PMD compensation. To the contrary, MacFarlane's filtering is based on the need to compensate for three types of dispersion, including polarization dispersion, which is PMD (col. 1 lines 43-46).

In the Remarks page 9 lines 1-9, Applicant argues that the cited portion of Eyal does not teach that filter coefficients are adjusted using a Newton algorithm, arguing that the Newton adjustments cited are directed to the correction of optimization variables that are distinct from the coefficients in the preceding discussion of the same paragraph. However, the optimization variables of Eyal are effectively filter coefficients for the compensating filter, regardless of Eyal's use of the term "coefficient" for other designations (e.g. Fourier coefficients).

In the Remarks page 9 lines 23-25, Applicant argues that MacFarlane does not disclose or suggest that PMD is reduced using a cascade of two-port all-pass filters. Nevertheless, since Madsen already discloses using a cascade of two-port all-pass filters, there is no requirement for MacFarlane to provide a duplicate teaching. The relevant teaching of MacFarlane is that of the LMS algorithm for adjusting filter coefficients, as previously discussed.

In the Remarks page 9 line 26 to page 10 line 5 and page 10 lines 18-21, Applicant argues that the LMS algorithm discussed in MacFarlane col. 19 lines 16-22 is not in connection with the adjustment of filter coefficients, and argues that the LMS disclosure is tied to gain adjustment. To the contrary, the LMS disclosure is tied to adaptive signal processing algorithms for adjusting the filters to minimize errors, which includes those caused by PMD in light of col. 1 lines 43-46.

In the Remarks page 10 lines 13-18, Applicant argues against the rationale of the combination, arguing that the use of LMS algorithms in the manner suggested by the present invention is more than mere design choice. However, Applicant does not support this assertion with any further reasoning or evidence against the use of LMS over LS as a design choice, therefore the argument is not persuasive.

In the Remarks page 10 lines 26-28, Applicant argues that there is no *suggestion* in Madsen or MacFarlane to adjust coefficients of a cascade of two-port all-pass filters using an LMS algorithm. Nevertheless, it would have been obvious to do so for the reason outlined in the rationale of the rejections. Applicant is directed MPEP § 2141.III, which explains rationales to support rejections under 35 USC § 103, and states: "The prior art reference (or references when combined) *need not teach or suggest all the claim limitations*, however, Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art." [emphasis added]. In the rejections above under 35 USC § 103, a rationale is provided for why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art.

In the Remarks page 11 lines 7-17, Applicant's arguments, of the complexity of using two-port all-pass filters versus using FIR filters, etc., and that the general knowledge of one of ordinary skill would "teach away" from using two-port all-pass filters, are not persuasive because the two-port all-pass filters are achieved by express disclosure, not by combination; i.e. Madsen already discloses two-port all-pass filters. The Applicant's citation of *KSR* is misapplied because it is it concerned with teaching away from *combining*, not teaching away from *ever using even if already expressly disclosed*, which is essentially the Applicant's position.

In the Remarks page 12 lines 13-15, Applicant argues that Eyal doesn't teach a cascade of two-port all-pass filters. As with MacFarlane, Madsen already discloses using a cascade of two-port all-pass filters, there is no requirement for Eyal to provide a duplicate teaching. The relevant teaching of Eyal is that of the Newton algorithm for adjusting filter coefficients, as previously discussed.

In the Remarks page 12 line 16 to page 14 line 2, Applicant essentially repeats previous arguments, which are unpersuasive for the reasons already provided above.

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Conclusion

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to NATHAN M. CURS whose telephone number is (571)272-3028. The examiner can normally be reached on 9:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/NATHAN M CURS/

Primary Examiner, Art Unit 2613